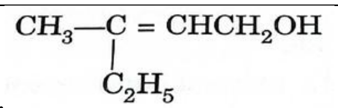
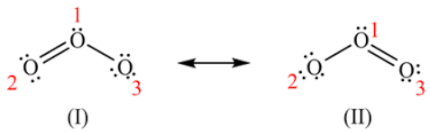
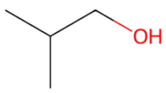
Indian School Al Wadi Al Kabir
Assessment – 2 (2025-2026)

CHEMISTRY-Code No. 043
Class-XI-(2025-26)

SET: 1

MARKING SCHEME

1.	A. 24 g of C (atomic mass of C=12u)	**1**
2.	C. Molefraction	**1**
3.	C. 3 and 9	**1**
4.	C. Fe^{2+}	**1**
5.	C.By absorption of electromagnetic radiation of a particular frequency	**1**
6.	A.Li	**1**
7.	C. Transition metals	**1**
8.	C.CO_2	**1**
9.	C. sp	**1**
10.	A. Gain of electrons	**1**
11.	A. Methyl	**1**
12.	C. 	**1**
13.	A. Both A and R are true, and R is the correct explanation of A.	**1**
14.	B. Both A and R are true, but R is not the correct explanation of A.	**1**
15.	B. Both A and R are true, and R is not the correct explanation of A.	**1**
16.	B. Both A and R are true, and R is not the correct explanation of A.	**1**

17.	A. I. $E_n = -R_H \frac{Z^2}{n^2}$ $E_1 = -(2.18 \times 10^{-18}\ \text{J}) \frac{2^2}{1^2}$ $E_1 = -8.72 \times 10^{-18}\ \text{J}$ II. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$ **OR** B. I. $r_n = \frac{n^2 a_0}{Z}$ = $r_1 = \frac{1^2 \cdot (5.29 \times 10^{-11}\ \text{m})}{2}$ = 2.645×10^{-11} m. II. It states that electrons are filled into atomic orbitals in the increasing order of orbital energy level.	**1** **1** **1** **1**
18.	I.The primary difference in structure between carbon dioxide and sulfur dioxide is that CO2 is a linear molecule, while SO2 is a bent or V-shaped molecule. This difference arises from the presence of a lone pair of electrons on the central sulfur atom in SO2 which is absent in the central carbon atom of CO2 II. 	**1** **1**
19.	I. +2 II. $MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$	½ **1 ½**
20.	**Anode reaction: $2Cl^- \rightarrow Cl_2 + 2e^-$** **Cathode reaction: $2Fe^{3+} + 2e^- \rightarrow 2Fe^{2+}$**	**1** **1**
21.	I.  II. 2,3-dimethylbutanal	**1** **1**
22.	I.Molarity is the number of moles of a solute per liter of solution Molarity = moles of solute / liters of solution. It is affected by changes in temperature because temperature changes alter the volume of the solution due to thermal expansion. II. No, these substances are not the same. This can be justified using the Law of Constant Proportions (Law of Definite Composition), which states that a given chemical compound always contains elements in a fixed ratio by mass, regardless of the source or method of preparation.	**1** **1** **1**
23.	I.The metallic character of an element can be defined as how readily an atom can lose an electron.Metallic character increases as you move down a group because	**1**

	the atomic size is increasing. When the atomic size increases, the outer shells are farther away.The electrons of the valence shell have less attraction to the nucleus and, as a result, can lose electrons more readily. This causes an increase in metallic character. II. The ionization energy of potassium is lower than that of sodium because the outermost electron in potassium is in the 4s subshell, which is further away from the nucleus compared to the 3s subshell of sodium. This results in a weaker attraction between the outermost electron and the nucleus, requiring less energy to remove the electron. III. ns2np1-6	**1 ½** ½
24.	I.H_2O is a liquid at room temperature while H_2S is a gas because water molecules form strong intermolecular hydrogen bonds, whereas hydrogen sulfide molecules have only weak van der Waals forces. II. The bond angle in ammonia is 107 0 because the lone pair of electrons on the nitrogen atom repels the bonding pairs more strongly than the bonding pairs repel each other III.HF < HCl < HBr < HI.	**1** **1** **1**
25.	I.$HgCl_2$. II Aluminum is the anode and Nickel is the cathode **Anode (oxidation):** $Al(s) \rightarrow Al^{3+}(aq) + 3e^-$ **Cathode (reduction):** $Ni^{2+}(aq) + 2e^- \rightarrow Ni(s)$ $2Al(s) + 3Ni^{2+}(aq) \rightarrow 2Al^{3+}(aq) + 3Ni(s)$	½ **1** **1 ½**
26.	I. (a) to maintain electrical neutrality in the two half-cells (b) To ensure continuous flow of charges by completing the circuit II. A disproportionation reaction is a type of redox reaction where a single chemical species is simultaneously oxidized and reduced.	**2** **1**
27.	I. In the estimation (and detection) of carbon and hydrogen in an organic compound, copper(II) oxide (CuO) acts as a strong oxidising agent.It changes the Carbon in the compound to carbondioxide II. A nucleophile is an atom or molecule that is electron-rich and capable of donating a pair of electrons to form a new covalent bond Any apt example III. Any suitable example IV. The blood-red color is produced because the compound contains both nitrogen and sulfur.	½ +½ ½ +½ **1** **1**

28.	I. Steam distillation II. Butane: $CH_3 - CH_2 - CH_2 - CH_3$ Isobutane: $CH_3 - CH(CH_3) - CH_3$ Chain isomerism The inductive effect is the permanent displacement of electrons through a molecule's sigma bonds due to differences in electronegativity between atoms.	½ ½ ½ ½ **1**
29.	I. 128. g. (Molar mass of Naphthalene) II. 1.2044x 1024 atoms **OR** $(6.022 \times 10^{22}) \times 12 = 7.2264 \times 10^{23}$ atoms III. Mass of one silver atom = $\frac{108 \text{ g}}{6.022 \times 10^{23} \text{ atoms}}$ 17.93×10^{-23} g	**1** **1** **2**
30.	I. Ionization enthalpy generally increases from left to right across a period because the nuclear charge increases, pulling the electrons more strongly towards the nucleus. OR Electron gain enthalpy is the energy change that occurs when a neutral, isolated atom in its gaseous state acquires an electron to form a negatively charged ion (anion). II. 4th period and 17th group III.Iodine has a larger atomic radius than fluorine because it is in the same group but a lower period on the periodic table, meaning it has more electron shells	**1** **1** **2**

31. A.I.16 electrons ½

II.mv=h/λ $=6.626\text{x}10^{-34}/6626 \text{ x } 10^{-12}$ m. 1 ½

$=10^{-25}$ m

III. $$E_4 = -\frac{2.18 \times 10^{-18} \text{ J}}{(4)^2} = -\frac{2.18 \times 10^{-18} \text{ J}}{16} = -1.3625 \times 10^{-19} \text{ J.}$$ 3

$$E_2 = -\frac{2.18 \times 10^{-18} \text{ J}}{(2)^2} = -\frac{2.18 \times 10^{-18} \text{ J}}{4} = -5.45 \times 10^{-19} \text{ J.}$$

$E_2 - E_4 = -5.45 \times 10^{-19} \text{ J} - (-1.3625 \times 10^{-19} \text{ J}) = 4.0875 \times 10^{-19}$ J.

$\nu = .61 \text{ x } 10^{15}$ Hz

.

OR

I.

$$\lambda = \frac{6.626 \times 10^{-34} \text{ Js}}{0.001 \text{ kg} \times 10 \text{ m/s}} = 6.626 \times 10^{-32} \text{ m.}$$ 2

II. mvr = n(h/2π)

λ = h/mv 2

2πr = nh/mv

2πr = nλ

III. Any two limitations 1

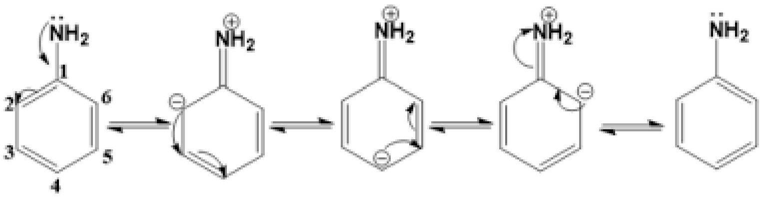
32.	A. I. The central phosphorus (P) atom has 5 valence electrons, and each of the five chlorine (Cl) atoms contributes 1 electron to the bonding, for a total of 5 bonding pairs.these five electron pairs orient themselves to minimize repulsion, leading to a trigonal bipyramidal shape.There are three bonds in the equatorial position with an angle of 120o and two in the axial postion with an angle of 90o.Axial bonds experience greater repulsion from the three neighboring equatorial bond pairs at a 90° angle.Equatorial bonds experience repulsion from the two axial bond pairs at a 90° angle, and weaker repulsion from the other two equatorial pairs at 120.Hence axial bonds are slightly longer and weaker than equatorial bond. II. Beryllium chloride has a zero-dipole moment because of its linear molecular geometry. III. $(\sigma 1s)^2(\sigma^* 1s)^2(\sigma 2s)^2$ $\text{Bond Order} = \frac{N_b - N_a}{2} = \frac{4-2}{2} = 1$ The molecule is stable III. **OR** I. $\sigma^2_{1s}\sigma^{*2}_{1s}\sigma^2_{2s}\sigma^{*2}_{2s}(\pi^1_{2p_x} = \pi^1_{2p_y})$ $\text{Bond Order} = \frac{6-4}{2} = \frac{2}{2} = 1$ Paramagnetic because of the presence of unpaired electrons. II.Hybridisation is the concept of mixing atomic orbitals within an atom to form a new set of degenerate (equal energy and identical shape) hybrid orbitals, which are then used in bond formation. C ground state electronic configuration- 1s2,2s2 2p2 the excited state configuration of 1s2 2s12px12py12pz1 sp^2 hybrid orbitals.The remaining 2pz orbital does not participate in hybridisation and remains unhybridised.trigonal planar geometry with bond angles of approximately 120°.The unhybridised 2pz orbitals on each carbon atom, which are parallel to each other and perpendicular to the sp^2 plane, overlap sideways to form a pi bond above and below the plane of the sigma framework. It forms C-C sigma and sigma C-H bonds.	**2** **1** **2** **1** **1** **½** **1** **1 ½**

V.

A

(I) Reaction intermediates are short-lived, highly reactive species formed during a chemical reaction by the breaking of chemical bonds. They are generated through two main types of bond fission: homolytic fission, where a covalent bond breaks evenly and each atom gets one electron, forming neutral free radicals, and heterolytic fission, where the bond breaks unevenly and one atom takes both electrons, creating charged species like carbocations and carbanion.

2



(II)

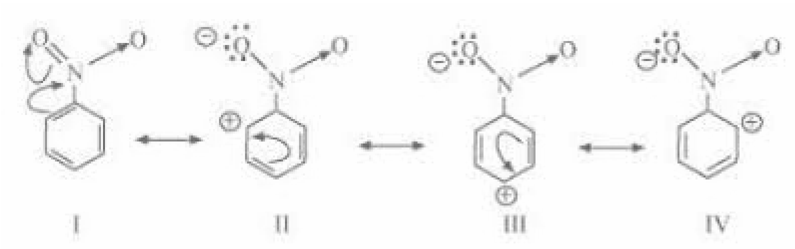
2

IV. The structure I will be more stable. Because more no of covalent bonds are present in structure I

1

OR

B



I.

2

II.Electron-donating groups can stabilize a carbocation.Hence Tertiary >Secondary>primary>methyl.

Any suitable example to support this

2

III. Hyperconjugation is a permanent stabilizing interaction in organic chemistry involving the delocalization of electrons from a sigma bond into an adjacent, vacant non-bonding p-orbital .

1